J.R. SIMPLOT COMPANY – SMOKY CANYON MINE

STANDARD OPERATING PROCEDURE No. 15

BENTHIC MACROINVERTEBRATE TISSUE AND COMMUNITY SAMPLING

1.0   PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) describes the protocols to be followed to conduct the collection of benthic macroinvertebrates from locations around Smoky Canyon Mine.   The purpose of the collection is to: 1) obtain samples that can be analyzed to determine the concentration of selenium in benthic macroinvertebrate tissues that serve as a prey base for higher-order consumers; and 2) document and evaluate benthic macroinvertebrate community characteristics including composition, structure, and function.

2.0   EQUIPMENT NECESSARY FOR BENTHIC MACROINVERTEBRATE SAMPLING

Equipment that may be necessary for benthic macroinvertebrate sampling includes:

- Field book, sampling data sheets, and black pens;
- Surber stream sampler (12 inch x 12 inch frame, 0.5 mm net mesh);
- D-Ring Kick Net (0.5mm mesh net);
- 2 1-gallon plastic buckets;
- Sorting pans;
- 1 Liter wash bottles;
- Small metal or plastic forceps;
- 70% ethanol solution or isopropyl alcohol;
- Clear glass sample jars; and
- Insect vials.

3.0   PROCEDURES

3.1   Sampling Location

Benthic macroinvertebrate samples will be collected at each of the locations specified by the Smoky Canyon Mine RI/FS Work Plan.

3.2   Field Sampling from Creeks and Streams

Benthic macroinvertebrate samples will be collected using a D-ring Kick Net or Surber sampler depending upon the intended use of the sample. Benthic macroinvertebrate samples collected for tissue residue analyses will be collected using a D-Ring Kick Net from multiple habitat types including riffles, pools and instream vegetation. A Surber sampler will be used to collect organisms intended for community analysis.

In riffles, the sampler will be firmly placed in the stream substrate with the net opening open to the direction of flow. Larger cobble will be scraped by hand and visually inspected before removal from the sampler ring. The remaining substrate will be thoroughly agitated to a depth of 3 to 4 inches. Water flow will carry dislodged materials down into the net. If vegetation is sampled, a series of sweeps over the vegetation will be made if it is located in slow or non-flowing areas that may not have adequate velocity to carry dislodge organisms into the net. Vegetation sampling in flowing waters will be similar to that for riffles. In pools, the substrate will be disturbed via kicking and the net will be swept through the disturbed area if water velocity is not sufficient to carry dislodged organisms into the net.

The contents of the net will be emptied into a clean bucket or clean sorting pan and the net will be pulled inside out. Initially, 3 separate samples will be collected for each site and composited.

When samples are being collected for the purpose of community analysis, a Surber sampler will be used for collections. Similar to collecting benthic macroinvertebrates using the D-Ring Kick Net, bed surfaces are agitated and the dislodged materials are

carried via water flow into the net. The contents of the net will be emptied into a clean bucket or clean sorting pan.

For both sampling methods, the net will be inspected for any remaining attached organisms. If extraneous materials are attached to the collected benthos, the organisms may be rinsed with distilled water in a separate container, such that only benthic organisms are placed into the sample container.

3.3   Sorting Procedures

3.3.1   Samples for Tissue Residue Analyses

A preliminary sort of the organisms present will be conducted to estimate the predominant taxonomic groups representative of the sample. The tissue sample will be based on a proportion of the predominant groups. For example, if mayflies predominate, then they would represent the majority of the sample. Major groups used to create the sample, as well as an estimate of the percentage makeup of the sample, will be logged and predominate taxa groups will be vouchered for taxonomy.

The goal is to pick 5 grams of invertebrates for submittal to the laboratory for analysis; however, depending upon the composition and size of invertebrates present, 5 grams may not always be attained. If satisfactory biomass is not obtained from the first sample, additional samples will be collected (up to 3 total samples) to obtain a mass as close to 5 grams of benthic organisms as possible. Benthic macroinvertebrate tissue samples will be labeled in accordance to the procedures outlined in the Quality Assurance/Project Plan (QAPP) and stored on ice, unpreserved for shipment to the laboratory.

At locations where the benthic macroinvertebrate biomass is abundant, and if needed, an additional sample will be collected for the laboratory to conduct analyses for percent solids.

3.3.2 Samples for Community Analyses

The samples collected for community analyses will be preserved, labeled according to procedures identified in the QAPP, and shipped to a taxonomist for identification and enumeration.

If a sample appears to contain more than 600 organisms, it will be subsampled in the lab. Sub-samples will be obtained by pouring the entire sample into a quadrate sub-sampler with a 250 micron sieve. Material will be equally distributed within the pan by floating and leveling the material with water. The sieve is then to be removed from the water pan and the material within the sieve is to be divided into equal parts. One side of the sieve is then randomly selected to be processed and the other side is set aside. This process is repeated until approximately 500 organisms remain in one-half of the sieve.

3.3.2.1 Taxonomy

The sorted macroinvertebrates will be identified to the lowest practical taxonomic level and enumerated. Taxonomy will be conducted by a qualified taxonomist familiar with the benthic invertebrates of Idaho streams. Recognized published works for the identification of benthic invertebrates will be used as reference materials for taxonomic identification.

IDEQ taxon codes will be utilized for electronic data compiled from the laboratory bench sheets, such that transmittal of benthic invertebrate data can readily be utilized by IDEQ staff for assessing use attainment. Tolerance values and trophic characterizations will be assigned (Barbour et al. 1999). The Stream Macroinvertbrate Index (SMI) will be calculated according to (Jessup and Gerritsen 2000) as reported in Grafe ed. (2002).

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

QA/QC procedures outlined in the QAPP will be adhered to for this SOP. QA procedures identified in the QAPP are largely defined for chemical analyses of different

media types. Additional QA requirements for benthic invertebrate taxonomy are as follows.

Sorted sub-sample debris will be processed for missed organisms. A sorting efficiency guideline minimum of 90-95% is generally considered acceptable and will be conducted by a taxonomist different than that who conducted the initial sorting and identification. Three of the ten sorted sub-sample debris samples will be randomly selected and submitted for analysis. The sorting QA score is calculated as follows:

Sorting QA Score = 100 – ((number of organisms missed ÷ total number of organism in sample) X 100))

Taxonomy verification will also be conducted as a means of verifying the taxonomist's identification of an organism. This process also assists in cases of difficult identification (i.e., immature and partial organisms). At least two samples will be submitted to an independent laboratory for taxonomic verification analysis. The results of this analysis will be included in the data report. Taxon codes consistent with IDEQ's BURP protocols will be used to ensure a consistent level of taxonomy and future use by IDEQ.

As a check on the completion of appropriate field documentation, the Field Supervisor will check and verify that documentation has been completed and filed per this procedure and the other procedures referenced herein on a routine basis.

5.0   REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish.* Second Edition. EPA/841-B-99-002. U.S. EPA, Office of Water. Washington, D.C.

Grafe, C.S., ed. 2002. Idaho Small Stream Ecological Assessment Framework: An Integrated Approach. Idaho Department of Environmental Quality; Boise, Idaho.

Jessup, B and J. Gerritsen. 2000. *Development of a Multimetric Index for Biological Assessement of Idaho Streams Using Benthic Macroinvertebrates.* Prepared for the Idaho Department of Environmental Quality. Tetra Tech, Inc. Owings Mills, Maryland. 43 pp.